NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

FORAGE HARVEST MANAGEMENT

(Acre)
CODE 511

DEFINITION

The timely cutting and removal of forages from the field as hay, green-chop, or ensilage.

PURPOSES

- Optimize the economic yield of forage at the desired quality and quantity
- Promote vigorous plant regrowth
- Maintain stand life for the desired time period
- Maintain desired species composition of the stand Use forage plant biomass as a nutrient uptake tool
- Control insects, diseases and weeds
- Maintain and/or improve wildlife habitat

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where machine harvested forage crops are grown.

CRITERIA

General criteria applicable to all purposes

Forage will be harvested at a frequency and height that will maintain a desired healthy plant community through its life expectancy.

Harvest forage at the stage of maturity that provides the desired quality and quantity.

Harvesting, either by grazing or cutting, will be controlled so enough residue and/or growing crop remains throughout the year to control water erosion and soil blowing. Refer to Standard 528a – Prescribed Grazing for additional criteria for hayland grazing.

Additional criteria to improve or maintain stand life, plant vigor, and forage species mix

a. Stage of Maturity and Harvest Interval

If plants show signs of short-term environmental stress, management will be applied in a manner that ensures continued health and vigor of stand.

b Stubble Height

Cut forage plants at a height that will promote the vigor and health of the desired species. Cutting heights will provide adequate residual leaf area, adequate numbers of terminal, basal, or auxiliary tillers or buds; insulation from extreme heat or cold; and/or unsevered stem bases that store food reserves needed for full, vigorous recovery.

Additional criteria to use as a nutrient uptake tool

Employ a harvest regime that utilizes the maximum amount of available or targeted nutrients. See Practice Standard 633 – Waste Utilization

Additional criteria to control disease, insect, and weed infestations

If a foliar disease, insects, or weeds threaten stand survival or production objective, schedule harvest periods as needed to control disease, insect, and weed infestations.

Lessen incidence of disease, insect damage, and weed infestation by managing for desirable plant vigor.

See Practice Standard 595 – Pest Management.

Additional criteria to improve wildlife habitat values

Maintain appropriate harvest schedule(s), cover patterns, and plant height to provide suitable habitat for the desired specie(s).

CONSIDERATIONS

When pastures produce forage in excess of livestock demand during high growth rate periods, consider preserving forage quality by machine harvesting a portion of the standing crop. Coordinate this practice with the Prescribed Grazing (528a).

Select cultivars that are suitable for the harvest regime, species mix, and forage quality desired. For specific nutrient uptake, select species that can maximize uptake. Mixed grass/legume hay is nearly as high in protein and feed value as legumes seeded alone. Grass/legume mixtures generally produce 15 to 25 percent more forage than legumes seeded alone. When adapted grass species are seeded with a legume in a ratio of about 50-50, the grass will fill in areas where alfalfa dies out thus reducing weedy vegetation. Mixed hay fields require more intensive fertilizer management to maintain the proper grass-legume mixture. See Pasture and Hay Planting (512).

When insect and disease outbreaks exceed economic thresholds and are uncontrollable by harvest management pesticide applications may be needed. Another option is to select a resistant cultivar when the stand is replaced. See Pest Management (595).

Moisture Content

Harvest silage/haylage crops at the ideal moisture range for the type of storage structure(s) being utilized.

Treat direct cut hay crop silage (moisture content > 70%) with chemical preservatives or add dry feed stuffs to avoid fermentation and seepage digestible dry matter losses.

For optimal forage quality, rake, ted, or invert swaths, and bale when hay has sufficient moisture to prevent leaf loss.

Bale at optimum moisture levels to preserve forage quality and quantity. Approximate percent moisture should be as follows:

Bale field cured hay at 15 to 20 percent moisture.

Bale forced air-dried hay at 20 to 35 percent moisture.

Rake hay at 30 to 40 percent moisture.

Ted or invert swaths when moisture is above 40 percent.

Fertilizing

Well-fertilized plants withstand more intense harvest schedules and may produce a higher quantity and quality of forage. Coordinate this practice with the Nutrient Management (590).

Fertilize to meet the needs of the plant and to produce the amount of forage needed by the operator.

Use soil tests or tissue analysis to determine fertilizer needs. Experience and local tests can serve as a rule of thumb, but soil tests provide accurate information, which can prevent under or over fertilization.

Research has shown that on the tighter soils, there is no difference in total production between a single large nitrogen application and split applications. When a single application of N is applied, about half of the total production is made at the first cutting, and the other half is distributed over the remaining cuttings. For hay production, a single application would be best. Protein levels in the

last half of the growing season are slightly higher when split applications of N are made on the sandier soils, it is also better to apply split applications to prevent loss of the nitrogen through leaching.

Varying the ratio between nitrogen and phosphorous fertilizers can help maintain a balance between grasses and legumes in mixtures. Nitrogen increases grasses and phosphorus increases legumes.

NMSU Circular 478 "Fertilizer Guide for N.M." provides guidance on fertilizer requirements, application, and soil testing.

Irrigation Water Management

Establish rate, duration and frequency of irrigation that will be required to maintain soil moisture above 50 percent available water holding capacity during months of peak water use.

When practical, use the established frequency during the entire season in combination with time of harvest (either by grazing or cutting).

When possible, irrigate immediately after harvesting if needed.

Amounts of water applied at each irrigation will be adjusted to match the designed use rate and the operator's objectives. (See Local Irrigation Guide)

Irrigation frequency and amount will be adjusted when soil and/or irrigation water is high in soluble salts depending on the specific situation.

Adequate surface drainage should be provided. Allowing excess water to stand on fields can drown plants. The resulting open areas allow weeds and undesirable grasses to increase. The excess water also provides a breeding ground for insects and disease.

It is recognized that in many parts of the state, water must be applied when it is available and not when it is desired, and that water may NOT be available for part of the season. However, the operator should be aware of these factors so that water can be properly applied when it is available. We should also be as concerned here with OVER watering as we are with UNDER watering.

See Practice Standard – 449 – Irrigation Water Management.

Harvesting (Irrigated or Dryland)

Do not mow grasses and/or legumes for hay until well established. (See Standards and Specifications for Pasture and Hayland Planting.)

Harvesting should be based on stage of growth and the objectives of the operator. Harvesting at various stages of growth has an influence on protein content, total dry matter, percentage of leaves vs stems, total fiber, and total available carbohydrates in roots.

Continuously cutting alfalfa at an immature stage, such as the prebud or bud stage, will reduce total yield and cause the stand to deteriorate prematurely. Stand thinning is due primarily to a continuous reduction of food reserves in the roots. Alfalfa with low root reserves is especially susceptible to winter killing.

However, alfalfa cut at an immature stage has higher protein content and higher feeding value per pound than when cut at later stages. Thus, it becomes a question of very high quality feed vs total forage and stand longevity. Cutting at about 1/10th bloom stage gives you the highest total protein per acre and also the highest Total Digestible Nutrients. The most damage to stand vigor occurs when alfalfa is cut at an immature stage shortly before frost in the fall.

Following establishment, perennial grasses and/or legumes should be cut for hay as follows:

Grasses all cuttings—harvest between the time the seed head begins to emerge from the boot to early bloom. Cutting earlier will result in higher protein levels but lower yields. Cutting later will increase total yields, but protein levels drop.

Minimum harvest heights for both grasses and legumes are shown in Practice Standard-528a-Prescribed Grazing (Table 1 & 2).

Suggested harvest for alfalfa harvest heights are as follows:

Alfalfa first cutting – at or near ½ bloom. All other cuttings after development of one-tenth to one-fourth bloom. Cut at 1-1/2 to 2 inches.

Harvesting of regrowth after the last full cutting should be done at or following date of the last killing frost if adequate forage is available.

The last full harvest of hay should not be done within three to four weeks of the average date of the first killing frost to allow time for replenishment of root reserves.

Avoid mowing when the soil is so wet that excessive compaction or damage to plants will result.

The values in the Table I below are indicative of changes, with maturity, of alfalfa. Other legumes would be similar. This data reflects only the relative changes, which occur, with changes in harvest frequency. It is not indicative of yields, which could be expected in any area of New Mexico.

Table I

Alfalfa Harvest Frequency and Maturity of Alfalfa

Harvest Frequency (days)	16	21	28	35	42
Percent Bloom	0	5	15	75	100
Percent Leaves	55	47	45	34	34
Percent Stems	45	53	55	66	66
Percent Protein (leaves)	30	29	27	27	23
Percent protein (stems)	15	13	11	12	12
Percent protein (forage)	23	21	18	17	16
Dry matter (tons/yr.)*	3.0	4.0	4.3	5.7	6.6
Relative Root Weights	2	3	4	7	9
Percent Total Available Carbohydrates in Roots	23	25	28	36	29
Basal Shoot Rating**	1	3	4	5	8

* These yields were converted to tons from small samples. Yield differences from cutting at various growth stages may be less from larger samples.

**The basal shoot rating is based on a scale of 1 to 10. Alfalfa should always be cut before the basal shoots are tall enough that cutting removes the tops (growing point). When the growing point of basal shoots is removed, rapid regrowth is delayed until new basal shoots develop.

Grazing Alfalfa Hayland (irrigated & dryland)

Grazing alfalfa fields during the winter period is detrimental to the next season's growth and production . In northern areas, the danger of stand thinning due to the loss of insulation and/or crown damage by trampling is much more likely in grazed fields than in ungrazed ones. In the southern part of the state, where nondormant alfalfa is grown, and the plant remains green throughout the winter, grazing is very damaging. Grazing removes

the green top growth, a warm spell occurs, and the alfalfa plant draws on its root reserves and makes additional top growth. Again, this is grazed off, and the cycle is repeated. This continuous drain on the root reserves results in a slower start when spring finally arrives. Stand thinning has again occurred due to the trampling plus many plants die because they have expended all of their root reserves before spring and have "starved" to death. The thinner stand results in lowered overall production the summer following the winter grazing.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each management unit, field or treatment unit according to the Criteria, Considerations, and Operation & Maintenance described in this standard. Place the detailed specifications in a site-specific job or design sheet. See Conservation Practice Job Sheet 511 for Forage Harvest Management.

These plans and specifications shall be consistent with this standard and shall describe the requirement for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

Before forage harvest, clear fields of debris that could damage machinery, or if ingested by livestock, lead to sickness (for example, hardware disease) or death.

Monitor weather conditions and take action accordingly before and after cutting to optimize forage wilting or curing time to preserve feed quality and prevent forage swaths or windrows from smothering underlying plants.

Monitor plant (crop) density, health and vigor to maintain adequate stand, ground cover and yields.

REFERENCES:

Ball, D. M., C. S. Hoveland, & G. D. Lacefield. Southern Forages. 1991. Potash & Phosphate Institute, Norcross, GA.

Barnes, R. F., D. A. Miller, & C. J. Nelson. Forages, The Science of Grassland Agriculture, Fifth Edition. 1995. Iowa State University Press, Ames, IA.

Hanson, A. A., D. K. Barnes, & R. R. Hill, Jr. Alfalfa and Alfalfa Improvement. 1988. American Society of Agronomy, Madison, WI.

Ishler, V. A. Et al. Harvesting and Utilizing Silage. 1991. Penn State University Circular 396. University Park, PA.

Matches, A. G. Anti-Quality Components of Forages. 1973. Crop Science Society of America Special Pub. No. 4, Madison, WI

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Smith, D. Forage Management in the North, Third Edition. 1975. Kendall/Hunt Publishing Company, Dubuque, IA.

Taylor, N. L. Clover Science and Technology. 1985. American Society of Agronomy, Madison, WI.

References Continued:

NMSU-College of Agriculture & Home Economics

Cooperative Extension Service-Agricultural Experiment Station

Publications

Publication Number	Series	Title	Author
A-309	GUIDE	Alfalfa Weevil or Clover Leaf Weevil	Durkin
A-311	GUIDE	Sanfoin Production	Glover
A-313	GUIDE	Alfalfa Weevil or Clover Leaf Weevil	Glover
A-314	GUIDE	Is Hay Storage Profitable?	Clevenger
A-316	GUIDE	Structure of a Hay Bale	Glover
A-317	GUIDE	Alfalfa Fertilization in New Mexico	Glover
A-318	GUIDE	Reducing Alfalfa Harvest Losses	Glover
A-322	GUIDE	Alfalfa Hay Grading	Glover
A-323	GUIDE	Alfalfa Variety Selection in New Mexico	Glover
A-324	GUIDE	Sampling Small Bales of Alfalfa Hay	Currier
RR-590	Research	Evaluation of Six Legumes Under Different Irrigation and Nitrogen Fertilization Levels in North-Central New Mexico	Tapia
RR-595	Research	Fall Growth of Alfalfa and Cultivar Adaptation	Field
RR-677	Research	Performance of Warm & Cool Season Perennial Grasses under Irrigation	Kirksey
RR-678	Research	Economic Evaluation of Alfalfa Production under Less than Optimum Irrigation Levels	Libbin
RR-684	Research	Grazing Alfalfa and Winter Annual Small Grains with Angora Goats	Kiesling
RR-695	Research	Alfalfa Variety Trials in New Mexico	N/A